Climate Friendly Park Employees: A Climate Change Training Needs Assessment for the National Park Service Intermountain Region

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Abstract

The National Park Service (NPS) Intermountain Region partnered with the University of Arizona to assess climate change training needs for over 5,000 Intermountain Region employees. The assessment team evaluated baseline climate literacy and employee training preferences, and outlined plans for climate change training. In the literacy assessment, the team identified adequate understanding of key climate phenomena, such as El Niño, but a lack of discernment between climate variability and trends, and little knowledge of climate projections for the Intermountain Region. Analysis of surveys and interviews showed that Intermountain Region employees are concerned with the following training program implementation issues: information communication technology, funding, clear guidance on actions and policy changes, and communication with climate change skeptics. Intermountain Region employees recommended that training connect global changes to regional impacts and local solutions, and demonstrate relevance to job duties. They preferred interactive, group, and hands-on learning experiences, but agreed to use

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electronic media, if costs constrain program development. They identified information overload as a problem. To meet diverse needs, within fiscal constraints, we recommend a modular program, leveraging existing, well-vetted information resources. From a website evaluation exercise, we found adequate online training for climate change literacy, but a lack of training on topics such as mitigation of, and adaptation to, climate change.

Introduction

The NPS Intermountain Region contains diverse coastal, desert, mountain, and prairie ecosystems. Climate change and vanishing landscapes were among the top five Intermountain Region challenges enumerated in an unpublished 2009 report. To prepare for these challenges, the Intermountain Region engaged University of Arizona scientists to collaboratively assess needs for workshops and training to provide Intermountain Region employees with information that they could use to manage resources, mitigate greenhouse gas emissions, and plan to adapt to climate changes. The project goals were the following:

1. Assess the climate change knowledge level of a representative sample of Intermountain Region employees.
2. Determine the content, look, feel, and communication media of training modules for employees.
3. Develop a road map that links current and anticipated Intermountain Region climate change information needs.
4. Determine how to best leverage existing climate change information resources, and to reconcile information coming from different sources.

Methods

To evaluate climate change literacy and training preferences, the team used: a 21-question, structured online survey, using Likert-scale, multiple preference, and open-ended questions, and an 18-question, semi-structured interview protocol. The interviews were conducted after analysis of the survey, and interview questions were informed by survey results and knowledge gaps. Of the 5,379 Intermountain Region employees given the survey, 609 (12.6%) responded to the survey. The sample represented each of the 31 workforce roles, condensed by the research group from 166 unique NPS occupational series. Fifteen interviews were conducted with key informants, selected to represent a spectrum of job roles. Interview questions focused primarily on aspects of a training program, and secondarily on organizational challenges.

Survey and interview results: climate literacy. Eighty-three percent of respondents rated themselves as having fair or good knowledge of climate change. The majority of poor/very poor climate literacy self-ratings came from administrative assistants, office staff, budget and accounting, contracting and purchasing, facilities management, human resources, park manager, park ranger, and law enforcement. The self-ratings suggest initial areas to devote climate literacy training efforts. Most respondents correctly identified climate change impacts observed in the Intermountain Region, but could not correctly identify projected changes for the Intermountain Region. Whereas 90% of respondents correctly identified definitions of key terms, such as the greenhouse effect, and mitigation of, and adaptation to, climate change, fewer correctly matched seven examples of actions with the terms "mitigation" and "adaptation." Survey results also indicate the need for training on distinctions between climate variability, climate trends, and weather.

Survey and interview results: training and information communication preferences. Analysis of surveys and interviews shows that Intermountain Region employees prefer in-person climate change training, if cost is not an issue. Interviewees recommended mixed-method training programs that involve hands-on or on-the-job learning components, and interaction with fel-

low employees. Few Intermountain Region employees advocate online training, unless cost limits choices. A relatively small number of Intermountain Region employees identified internet access or connection speed as a limitation to the use of online training. In other cases, work schedule constraints may impede participation in group training. Based on these considerations, a flexible program is needed, with options that accommodate work schedule constraints, the remote locations of some employees, and technology limitations. Interviewees noted concern with information overload; thus, information must be tightly packaged (e.g., executive summaries, fact sheets, targeted presentations).

For climate change information to be adopted by Intermountain Region employees, survey and interview participants put a high priority on ensuring that information sources are transparent, credible, and legitimate. They recommended providing information that relates global phenomena to local phenomena, in a manner that is relevant to job duties and individual parks. To increase effectiveness and efficiency, participants recommended avoiding duplication of existing efforts by other federal agencies, and connecting with existing NPS training initiatives and conferences.

Survey and interview results: challenges to implementing a training program. We queried interviewees about challenges to implementing an Intermountain Region climate change training program. The interviewees noted inadequate information dissemination technology and communication networks, a lack of funding (e.g., for education, or for implementing actions to reduce impacts), the need for clear guidance on actions and policy changes, the importance of developing and disseminating clear, consistent, convincing messages, and improving communication with climate change skeptics, whether the skeptics are NPS staff, or members of the public. From long answer comments to the survey question "What information do you most urgently need to address climate change in your work?" we found that some Intermountain Region employees raised issues regarding the evidence for human-caused climate change; several others expressed faith-based objections to the notion of human-caused climate change. Interview results also indicated disagreement on whether a climate change training program should be mandatory. Resistance to a mandatory program would pose challenges to training program coherence and effectiveness.

Suggestions for a training program. We developed several tools for targeting climate change training with associated employee categories, and to meet their work-related needs. These include core topics for employee training (Tables 1 and 2), and curricula (Table 3) that outline key concepts, decision trees that associate topics with employee categories and suggest pathways for training (not shown), and criteria for vetting climate change training resources (Table 4).

We categorized NPS jobs into five broad groups: operations and administration, interpretation and education, research scientists, planners and engineers, and managers. We recommend that all employees receive training in the core topics of basic climate literacy, policies and responses by their parks, and essentials of mitigation actions that relate to their job duties and their park. For employees who interact with the public as part of their job duties, we suggest training in communicating climate change information.

For each of the five employee groups, we listed core training topics and reasons for including those training topics (Table 1). Park interpreters serve as the primary NPS interface with the public, and they could serve as key resources on climate change training for other employees. Consequently, we recommend that interpreters and educators receive training in a wide range of topics, which would include adaptation to climate change, and a deeper level of training in the core topics, in order to effectively communicate climate change principles and answer questions from the public and fellow employees.

In contrast, in their jobs, planners and engineers design infrastructure used to mitigate or adapt to climate change, and they inform mitigation compliance actions and develop adaptation

Category	Training Rationale	Sample Curricula
Operations and administration	Inform mitigation behavior; prepare for casual engagement with public	Climate literacy; National Park Service climate change policy and actions; workplace mitigation actions; procedures for addressing questions from the public
Interpretation and education	Primary interface with the public; support mitigation compliance efforts; train other employees	In-depth climate literacy; National Park Service climate change policy and actions; workplace mitigation actions; adaptation planning and actions; in-depth procedures for addressing questions from the public
Research scientists	Inform research practice and methods; inform development of science information for mitigation and adaptation decision making; lay groundwork for collaboration with other scientists; prepare for casual engagement with the public	Technical climate literacy; science to support mitigation planning; adaptation planning and actions; procedures for addressing questions from the public
Planners and Engineers	Inform mitigation compliance and development of adaptation strategies; inform approaches for addressing uncertainty in decision making; prepare for casual engagement with the public	Technical climate literacy; mitigation planning and compliance regulations; in-depth adaptation planning and actions; frameworks for addressing uncertainty in decision making; procedures for addressing questions from the public
Managers	Depending on level of management: inform mitigation and adaptation strategy policy and program development; inform approaches for addressing uncertainty in decision making; prepare for engagement with the public; prepare for partnerships and collaboration	In-depth climate literacy; mitigation planning and compliance regulations; in-depth National Park Service climate change policy and actions; adaptation planning and actions; frameworks for addressing uncertainty in decision making; in-depth procedures for addressing questions from the public

Table 1. Climate change training job categories, rationales and abbreviated curricula.

Topic and course	Motivating questions
Climate Literacy	
Climate Literacy 1	What is the evidence for global climate change and how does it relate to historic change in my local situation?
Climate Literacy 2	At a deeper level, what does the evidence show, and what do climate models project for my region?
Climate Literacy 3	What information do National Park Service scientists need for their investigations?
Communication	
Communication 1	How do I address climate change questions from park visitors?
Communication 2	How do I address questions from policy-makers, public officials, and skeptics?
Responses	
Adaptation 1	How can we adapt?
Adaptation 2	What strategies should I consider for my Park?
Mitigation 1	What can I do (in my job)?
Mitigation 2	What can we do (National Park Service, regionally, society)?
Mitigation 3	What are the relevant mitigation compliance and planning regulations, protocols, and considerations?
Decisions	
Climate Change Decisions 1	How should I deal with the uncertainties associated with climate change?
Climate Change Decisions 2	What is the scientific background needed to support decision making?
Parks	
Parks 1	What's going on in my park?
Parks 2	What's going on in the National Park Service and in the parks?
Parks 3	What policies, actions, and collaborations pertain to my park and throughout the National Park Service?

Table 2. Core topics and motivating questions for Intermountain Region climate change training.

Course	Curriculum Outline
Climate Literacy 1 Rationale: Basic climate change science for laypeople, that highlights the connections between global-scale climate system changes and their local manifestations	Title: Climate change: global to local What changes climate? (natural factors, greenhouse effect, past climates) Evidence of change (global temperature, oceans, snow and ice, drought, ecosystems, greenhouse gas emissions) How sure are scientists? (observations, paleo-climate, models, confidence) Local historic context (local and traditional knowledge of historic climate and extremes) U.S. initiatives (National Park Service, Department of Interior, Landscape Conservation Cooperatives, Climate Science Centers)

Table 3. Sample climate literacy curriculum outline.

strategies. We recommend that planners and engineers receive training in the core topics, but at a level specific enough for the plans and decisions that they make. We also suggest training in adaptation, climate change uncertainties, and in scenario planning and other decision frameworks. The kind of climate literacy required for planners and engineers might, for example, include a deep understanding of how climate and hydrology model projections are developed and the uncertainties associated with model projections. Training for planners and engineers would also require an understanding of any changes to the details of federal regulations for compliance with environmental standards.

Website assessment. We evaluated over 150 websites containing climate change training, information, and resources, with a focus on climate literacy mitigation and adaptation planning. We made a distinction between training and information. Training has obvious beginning and ending points, a well-defined and consistent structure geared toward education, and provides a structured flow from topic to topic. In contrast, there is abundant information, which is often loosely organized, and lacks a clearly defined structure for guiding users through related materials; thus, guiding NPS employees toward information, even if it is well articulated, would be counterproductive for a training program.

In our initial screening, we divided web resources based on whether or not they provided training. In our secondary screening, we evaluated websites and training materials, using criteria, modified from a review form developed by the Climate Literacy & Energy Awareness Network (http://cleanet.org). Our overarching criteria include accuracy of scientific information, evidence of pedagogic considerations, website usability and technical quality, assessment of its match to our audiences, and an overall rating (Table 4). The reviews document decisions for recommending training materials to the Intermountain Region.

We learned that most online climate literacy training is geared toward the general public and would be suitable for what we have referred to as "Climate Literacy 1" (Tables 2 and 4). The COMET program website (http://www.comet.ucar.edu/) contains Climate Literacy 1 training, and some material suitable for more detailed climate literacy training; COMET, a partnership between the University Center for Atmospheric Research and the National Weather Service, also provides in-person training for a fee, which may be useful to meet the training preferences of Intermountain Region employees, given ample budgets.

We found substantial gaps in training on decision making under uncertainty, vulnerability assessment, and climate change adaptation planning. Much of what constitutes training on adap-

Category or questions
Scientific accuracy
Is an attribution provided that represents a credible source, such as a university or government agency?
Has the resource been developed and/or reviewed by trained professionals, i.e., scientists?
Resource includes reference to IPCC 2007
Does the resource present valid and/or accurate concepts?
Are links to the original data sources provided?
Where appropriate, are references, bibliographies, and other supporting material provided?
Do citations contain peer-reviewed material published since 2007?
Pedagogic effectiveness
Has the resource been developed and/or reviewed by trained professionals, i.e., teachers?
Are learning objectives clearly stated?
Does the training include different forms of presenting information (e.g., text, graphics, audio, video, interactive exercises)?
Are prerequisite skills and understandings accurately indicated?
Is there any indication that common preconceptions and/or misconceptions are addressed?
Is there testing on the material learned?
Does the resource provide a vehicle for asking questions, or seeking further information beyond the activity?
Does the resource provide clear and comprehensive guidance for teachers to effectively teach the activity (ONLY for training the trainer)?
Ease of use and technical quality
Is the resource free of distracting or off-topic advertising?
Has the website won any relevant awards?
Are hyperlinks functional and up-to-date?
Do hyperlinks take the learner offsite for any components of training?
Are training materials and tools freeware?
Does the resource meet technical criteria that make it ready for use?
Is necessary material available in printable hand-out form?
Audience
Operations and administration
Interpreters, education specialists, trainers
Planners, designers, engineers
Research scientists
Resource "on-the-ground" management
Upper management (users of executive summaries)
Overall rating of relevance
High priority (resource likely to be included in collection of excellent resources)
Medium priority (resource meets basic standards)
Low priority (resource meets basic standards, but is of lower priority)
Hold for later review (keep in pool for another review at later stage)
Excellent but incomplete (excellent and relevant, but needs improved activity sheet)
Do not include (resource doesn't meet basic standards)

Table 4. Criteria for climate change training resources.

tation planning is available from websites in the United Kingdom or Australia. The Intermountain Region could target resources toward subject areas for which there is little online training, or toward developing courses and training related to adaptation and decision making under uncertainty, as opposed to devoting resources to the already abundant basic climate literacy training resources.

Conclusions

Based on survey results, we found that NPS Intermountain Region climate literacy training must focus on distinctions between climate variability and trend-driven change, future projections for the Intermountain Region, and nuances in terminology essential to the NPS Climate Change Response Strategy. Based on analysis of survey and interview results, we recommend flexible, low or no cost, modular climate change training for the Intermountain Region, such as existing well-vetted online resources. High-quality basic climate literacy resources exist, but topics, such as adaptation to climate change, exist only as information, and not well-bounded training. We developed tools for implementing climate change training, including key topics, curriculum outlines, and decision trees for matching content with job duties.

Two challenges for implementing climate change training are keeping pace with changing information in a dynamic and rapidly changing information environment, and producing sufficient NPS Intermountain Region-specific materials. We note several opportunities to leverage federal and NPS efforts to produce, implement, and maintain information and training. These include the Department of Interior Landscape Conservation Cooperatives and Climate Science Centers, and insights produced by George Melendez Wright Climate Change fellowship research. The upcoming U.S. National Climate Assessment effort will bolster Intermountain Region's efforts to develop region-specific and up-to-date materials.

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